

## PRODUCTION OF ADSORBENT FROM LOCAL RAW MATERIALS FOR THE REMOVAL OF FLUORIDE FROM WATER

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### ABSTRACT

This study investigated the adsorption capacity of locally prepared adsorbents from Goat bones and Egg shells for the removal of fluoride ion in water. It evaluated the performance of these adsorbents calcined at 300<sup>0</sup>C and modified with 1.0M HNO<sub>3</sub> (trioxonitrate (v)) acid. Batch adsorber was used to allow for interaction between adsorbents Bone char (BC) and Egg char (EC) with water containing fluoride ion. The batch experiment was performed with particle size of 2.12 $\mu$ m, contact time (60, 120, 180, 240, 300min), mass dosage (5g, 10g, 15g, 20g) and temperature (25<sup>0</sup>C, 30<sup>0</sup>C, 40<sup>0</sup>C, 50<sup>0</sup>C). The modified adsorbents were characterized to determine the physiochemical properties of Bone char (BC) and Egg char (EC). Also the chemical composition of both modified adsorbents were analyzed to determine the percentage of calcium element required for the uptake of the fluoride ions in water for calcium as 53.12% for BC and 39.68% for EC. Percentage adsorption increased with increase in contact time, mass dosage and temperature for both adsorbents. The adsorption capacity was also determined which also increased with increase in contact time, temperature but decreased with increase in mass dosage at constant time of 60minutes. The pseudo first-order, pseudo second order and intraparticle diffusion kinetic models were fitted into the experimental results. The results obtained indicated that the pseudo first order and intraparticle diffusion models reasonably described the adsorption process very well whereas the pseudo second order model was not suitable for a calcinations temperature of 300<sup>0</sup>C and particle size of 2.12 $\mu$ m. The adsorption isotherms were obtained from equilibrium experiment carried out at temperature of 25, 35, 45 and 55<sup>0</sup>C. The result showed that Langmuir and Freundlich isotherm fitted perfectly the experimental data. However, the negative values of Gibb's free energy indicated that adsorption was favourable and the positive enthalpy change  $\Delta H^0$  revealed that adsorption process was endothermic while the positive value of the entropy change  $\Delta S^0$  signified increased randomness with adsorption.

**Keywords:** Defluoridation, Bone char, Egg char, Fluoride, Adsorption, Water Treatment.